RADIO TEST REPORT

Test Report No. : 13473127S-B-R2

Applicant	:	**TOPCON CORPORATION**
Type of EUT	:	**Bluetooth Module**
Model Number of EUT	:	**CYBT-333047-02**
FCC ID	:	**H5P-333047**
Test regulation	:	**FCC Part 15 Subpart C: 2020** *** Bluetooth Low Energy part**
Test Result	:	**Complied (Refer to SECTION 3.2)**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
6. This test report covers Radio technical requirements.
   It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13473127S-B-R1. 13473127S-B-R1 is replaced with this report.

Date of test: August 24 to 27, 2020

Representative test engineer:
Toshinori Yamada
Engineer
Consumer Technology Division

Approved by:
Akio Hayashi
Leader
Consumer Technology Division

CERTIFICATE 1266.03

☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

REVISION HISTORY

Original Test Report No.: 13473127S-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13473127S-B	September 25, 2020	-	-
1	13473127S-B-R1	October 8, 2020	5	Update of Rating: From "DC 3.3 V (DC 2.97 V – DC 3.6 V)" to "DC 3.3 V (DC 2.3 V – DC 3.6 V)"
2	13473127S-B-R2	October 26, 2020	23,25-26	Addition: "August 26, 2020 22 deg. C / 55 % RH Makoto Hosaka (Below 1 GHz)"
			25	Correction of typo in Remarks: From "*2)" to "*1)"

Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation
AC	Alternating Current
AFH	Adaptive Frequency Hopping
AM	Amplitude Modulation
Amp, AMP	Amplifier
ANSI	American National Standards Institute
Ant, ANT	Antenna
AP	Access Point
ASK	Amplitude Shift Keying
Atten., ATT	Attenuator
AV	Average
BPSK	Binary Phase-Shift Keying
BR	Bluetooth Basic Rate
BT	Bluetooth
BT LE	Bluetooth Low Energy
BW	BandWidth
Cal Int	Calibration Interval
CCK	Complementary Code Keying
Ch., CH	Channel
CISPR	Comite International Special des Perturbations Radioelectriques
CW	Continuous Wave
DBPSK	Differential BPSK
DC	Direct Current
D-factor	Distance factor
DFS	Dynamic Frequency Selection
DQPSK	Differential QPSK
DSSS	Direct Sequence Spread Spectrum
EDR	Enhanced Data Rate
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
EN	European Norm
ERP, e.r.p.	Effective Radiated Power
EU	European Union
EUT	Equipment Under Test
Fac.	Factor
FCC	Federal Communications Commission
FHSS	Frequency Hopping Spread Spectrum
FM	Frequency Modulation
Freq.	Frequency
FSK	Frequency Shift Keying
GFSK	Gaussian Frequency-Shift Keying
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
Hori.	Horizontal
ICES	Interference-Causing Equipment Standard
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IF	Intermediate Frequency
ILAC	International Laboratory Accreditation Conference
ISED	Innovation, Science and Economic Development Canada
ISO	International Organization for Standardization
JAB	Japan Accreditation Board
LAN	Local Area Network
LIMS	Laboratory Information Management System
MCS	Modulation and Coding Scheme
MRA	Mutual Recognition Arrangement
N/A	Not Applicable
NIST	National Institute of Standards and Technology
NS	No signal detect.
NSA	Normalized Site Attenuation
NVLAP	National Voluntary Laboratory Accreditation Program
OBW	Occupied Band Width
OFDM	Orthogonal Frequency Division Multiplexing
P/M	Power meter
PCB	Printed Circuit Board
PER	Packet Error Rate
PHY	Physical Layer
PK	Peak
PN	Pseudo random Noise
PRBS	Pseudo-Random Bit Sequence
PSD	Power Spectral Density
QAM	Quadrature Amplitude Modulation
QP	Quasi-Peak
QPSK	Quadri-Phase Shift Keying
RBW	Resolution Band Width
RDS	Radio Data System
RE	Radio Equipment
RF	Radio Frequency
RMS	Root Mean Square
RSS	Radio Standards Specifications
Rx	Receiving
SA, S/A	Spectrum Analyzer
SG	Signal Generator
SVSWR	Site-Voltage Standing Wave Ratio
TR	Test Receiver
Tx	Transmitting
VBW	Video BandWidth
Vert.	Vertical
WLAN	Wireless LAN

CONTENTS **PAGE**

SECTION 1: Customer information

Company Name	:	TOPCON CORPORATION
Address	:	75-1, Hasunuma-cho, Itabashi-ku, Tokyo, 174-8580 Japan
Telephone Number	:	+81-3-3558-2634
Facsimile Number	:	+81-3-3966-0038
Contact Person	:	Eiji Takeuchi

The information provided from the customer is as follows;
- Applicant, Type of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (EUT) other than the Receipt Date
- SECTION 4: Operation of EUT during testing

* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

SECTION 2: Equipment under test (EUT)

2.1 Identification of EUT

Type	:	Bluetooth Module
Model Number	:	CYBT-333047-02
Serial Number	:	Refer to SECTION 4.2
Rating	:	DC 3.3 V (DC 2.3 V – DC 3.6 V)
Receipt Date	:	May 13, 2020
Country of Mass-production	:	U.S.A.
Condition	:	Production model
Modification	:	No Modification by the test lab.

2.2 Product Description

Model: CYBT-333047-02 (referred to as the EUT in this report) is a Bluetooth Module.

Radio Specification

Equipment Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480MHz
Type of Modulation	:	GFSK, π/4-DQPSK, 8DPSK
Antenna Type	:	1/2 λ sleeve antenna
Antenna Gain	:	2.14 dBi
Clock frequency (Maxmum)	:	24 MHz

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C FCC Part 15 final revised on June 26, 2020 and effective July 27, 2020
Title	:	FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods	**FCC:** Section 15.207	18.2 dB, 0.15000 MHz, N QP Mode: Tx 2402 MHz	Complied a)	-
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
6dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(a)(2)	See data.	Complied b)	Conducted
	ISED: -	**ISED:** RSS-247 5.2(a)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(b)(3)		Complied c)	Conducted
	ISED: RSS-Gen 6.12	**ISED:** RSS-247 5.4(d)			
Power Density	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(e)		Complied d)	Conducted
	ISED: -	**ISED:** RSS-247 5.2(b)			
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(d)	11.3 dB 45.528 MHz, QP, Vertical Mode: Tx 2480 MHz	Complied e), f)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)
	ISED: RSS-Gen 6.13	**ISED:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6.

a) Refer to APPENDIX 1 (data of Conducted Emission)
b) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)
c) Refer to APPENDIX 1 (data of Maximum Peak Output Power)
d) Refer to APPENDIX 1 (data of Power Density)
e) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
f) Refer to APPENDIX 1 (data of Radiated Spurious Emission)

Symbols:

Complied	The data of this test item has enough margin, more than the measurement uncertainty.
Complied#	The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

FCC Part 15.31 (e)
The RF Module has its own regulator. The RF Module is constantly provided voltage through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement
The EUT has a unique coupling/antenna connector (UFL). Therefore, the equipment complies with the antenna requirement.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	**ISED:** RSS-Gen 6.7	**ISED:** -	N/A	- b)	Conducted
b) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)					

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the results are derived depending on whether or not laboratory uncertainty is applied.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor *k*=2.

Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4,5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.6 dB	2.5 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.0 dB	3.0 dB	3.0 dB	-
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.6 dB	-
	200 MHz-1 GHz	6.0 dB	6.0 dB	6.0 dB	-
	1 GHz-6 GHz	4.9 dB	4.9 dB	4.9 dB	-
	6 GHz-18 GHz	5.5 dB	5.5 dB	5.5 dB	-
	18 GHz-40 GHz	5.4 dB	5.4 dB	5.4 dB	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.8 dB	5.8 dB	5.8 dB	-
	18 GHz-40 GHz	5.7 dB	5.7 dB	5.7 dB	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.98 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.75 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.89 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.12 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	1.06 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.24 dB
Spurious emission (Conducted) below 1GHz	0.9 dB
Spurious emission (Conducted) 1 GHz-3 GHz	0.9 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.9 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.6 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.0 dB
Bandwidth Measurement	0.07 %
Duty cycle and Time Measurement	0.262 %
Temperature	0.95 deg.C.
Voltage	0.83 %

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401
JAB Accreditation No. RTL02610

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test data, Test instruments, and Test set up

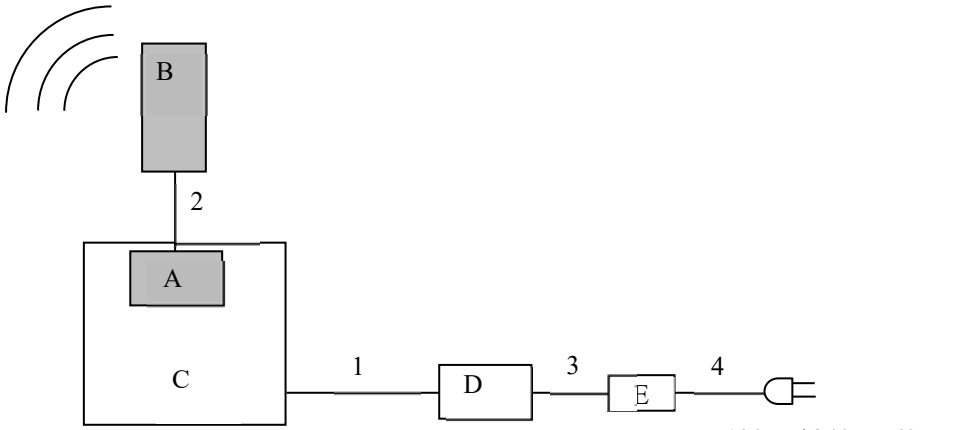
Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

Mode	Remarks*
Bluetooth Low Energy	Maximum Packet Size, PRBS9
*EUT has the power settings by the software as follows; - Power Setting: Fixed - Software: Cybluetool Ver.0.1.97.1 (Date: 2018.11.22, Storage location: Driven by connected PC) This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

4.2 Configuration and peripherals



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.
As a result of comparing AC 120 V and AC 240 V at pre-check, conducted emission test was performed with AC 120 V of the worst voltage as representative.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Bluetooth Module	CYBT-333047-02	No.5	Cypress Semiconductor	EUT
B	Sleeve antenna	1029-C17586	-	HOKO ELECTRONICS CO., LTD	EUT
C	Evaluation Board of Bluetooth	CYBT-333047-EVAL	1903-1-007 3	Cypress Semiconductor	-
D	Laptop Computer	ThinkPad L580	PF-1PMM0X	LENOVO	-
E	AC Adapter	ADLX45YCC2A	8SSA10E75842L1 CZ9480J61	LENOVO	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB	0.3+2.0	Shielded	Shielded	-
2	Antenna	0.15	Shielded	Shielded	-
3	DC	1.5	Unshielded	Unshielded	-
4	AC	0.8	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and conditions

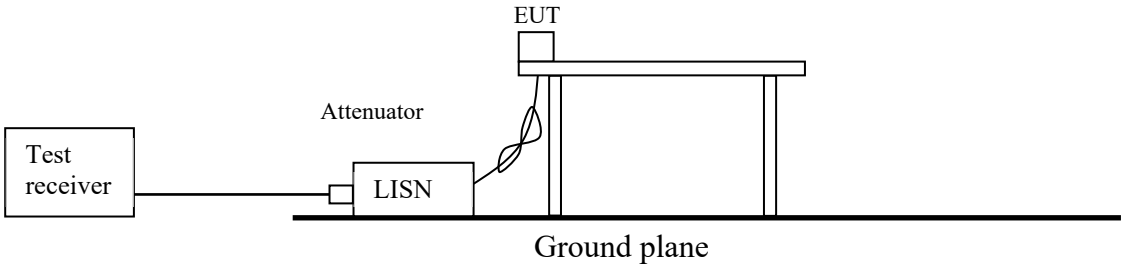
EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.
The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity.
The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN). I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a shielded room.
The EUT was connected to a LISN (AMN) via host device.
An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Detector **: QP and CISPR AV**
Measurement range **: 0.15 MHz - 30 MHz**
Test data **: APPENDIX**
Test result **: Pass**

Figure 1: Test Setup



SECTION 6: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]
EUT was placed on a platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane.
The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate.
That has very low permittivity. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

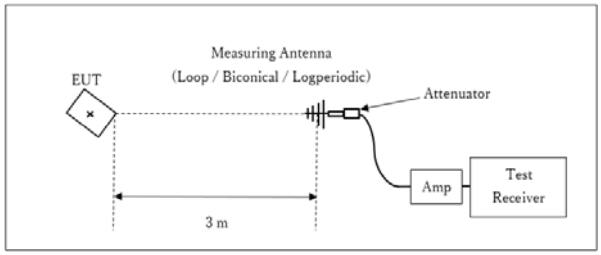
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	-	RBW: 100 kHz VBW: 300 kHz

*1) Measurement with Average detector was not performed. The limit for Average detector is applied to the measurement value with Peak detector used Duty cycle correction factor (DCCF).

Figure 2: Test Setup

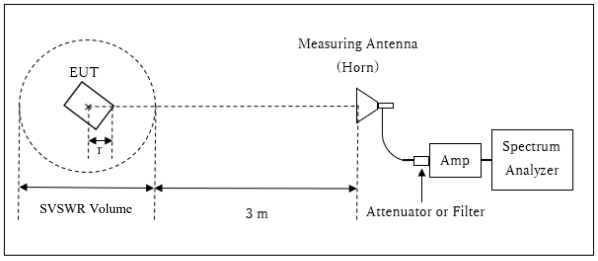
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 13 GHz

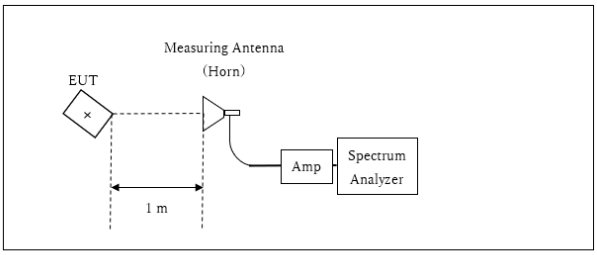


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.86 m / 3.0 m) = 2.19 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.86 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.14 m

13 GHz - 26.5 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 dB
*Test Distance: 1 m

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

	30 MHz - 1000 MHz	1 GHz -10 GHz	10 GHz -18 GHz	18 GHz -26 GHz
EUT axis	Horizontal: X Vertical: X	Horizontal: X Vertical: Z	Horizontal: X Vertical: X	Horizontal: X Vertical: X
Antenna axis	Horizontal: X Vertical: X	Horizontal: X Vertical: Y	Horizontal: X Vertical: X	Horizontal: X Vertical: X

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 30 MHz - 26.5 GHz
Test data : APPENDIX
Test result : Pass

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	20 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 160 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4) *5)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	10 kHz	30 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".
*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)
*5) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohmes. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to 45.5 – 51.5 = -6.0 dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

The test results and limit are rounded off to two decimals place, so some differences might be observed.
The equipment and cables were not used for factor 0 dB of the data sheets.

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2020/08/27

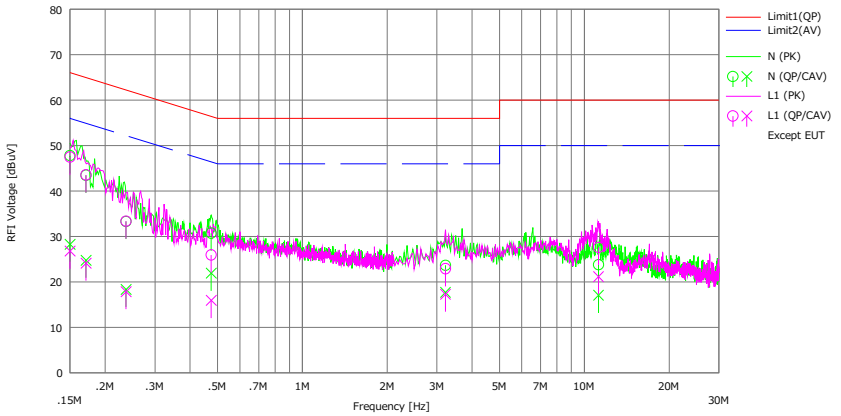
Mode : Tx BT LE 2402 MHz

Power : DC 5 V
Temp./Humi. : 22 deg.C / 51 %RH

Remarks : AC Adapter: AC 120 V / 60 Hz

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Makoto Hosaka



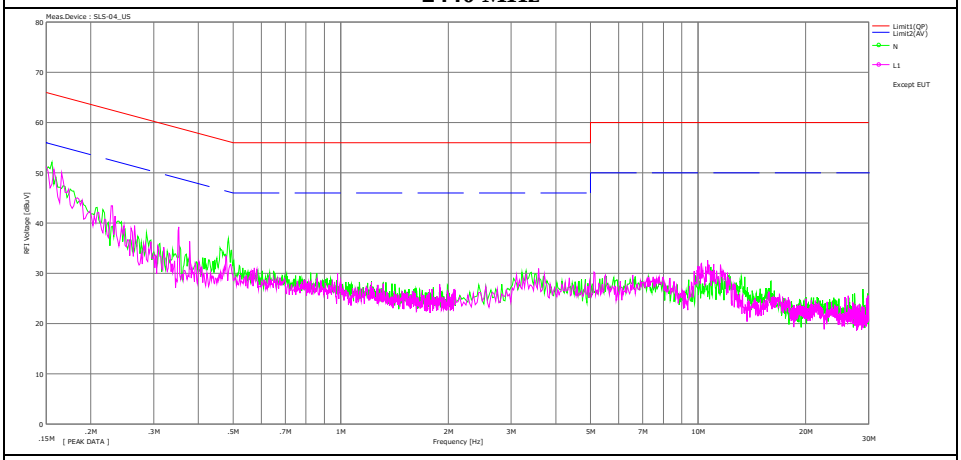
No.	Freq.	Reading		LISN	LOSS	Results		Limit		Margin		Phase	Comment
		〈QP〉	〈CAV〉			〈QP〉	〈CAV〉	〈QP〉	〈AV〉	〈QP〉	〈AV〉		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	35.30	15.80	9.61	2.84	47.75	28.25	66.00	56.00	18.2	27.7	N	
2	0.17100	31.00	12.30	9.61	2.84	43.45	24.75	64.91	54.91	21.4	30.1	N	
3	0.23700	20.80	5.90	9.61	2.85	33.26	18.36	62.20	52.20	28.9	33.8	N	
4	0.47500	18.20	9.40	9.63	2.88	30.71	21.91	56.43	46.43	25.7	24.5	N	
5	3.21800	10.90	5.00	9.68	3.04	23.62	17.72	56.00	46.00	32.3	28.2	N	
6	11.22400	10.60	3.90	9.83	3.31	23.74	17.04	60.00	50.00	36.2	32.9	N	
7	0.15000	35.00	14.30	9.61	2.84	47.45	26.75	66.00	56.00	18.5	29.2	L1	
8	0.17100	31.10	11.70	9.59	2.84	43.53	24.13	64.91	54.91	21.3	30.7	L1	
9	0.23700	20.90	5.40	9.60	2.85	33.35	17.85	62.20	52.20	28.8	34.3	L1	
10	0.47500	13.40	3.40	9.63	2.88	25.91	15.91	56.43	46.43	30.5	30.5	L1	
11	3.21800	10.20	4.60	9.66	3.04	22.90	17.30	56.00	46.00	33.1	28.7	L1	
12	11.22400	14.50	8.10	9.75	3.31	27.56	21.16	60.00	50.00	32.4	28.8	L1	

Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN)= SLS-04

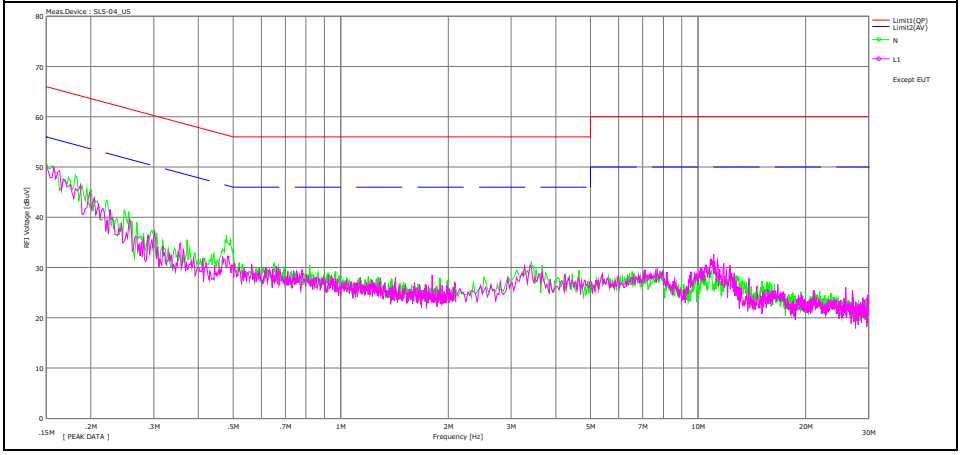
Except for the above table: adequate margin data below the limits.

Conducted Emission

2440 MHz



2480 MHz



UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

6 dB Bandwidth and 99 % Occupied Bandwidth

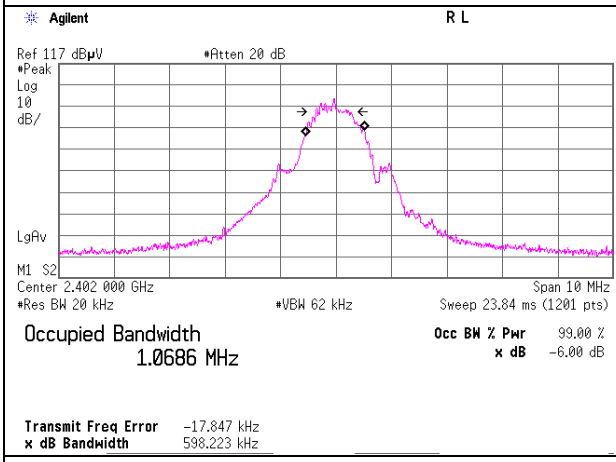
Report No.	13473127S-B-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 24, 2020
Temperature / Humidity	22 deg. C / 62 % RH
Engineer	Toshinori Yamada
Mode	Tx BT LE

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
BT LE	2402	1068.6	0.734	> 0.5000
	2440	1069.5	0.732	> 0.5000
	2480	1068.9	0.740	> 0.5000

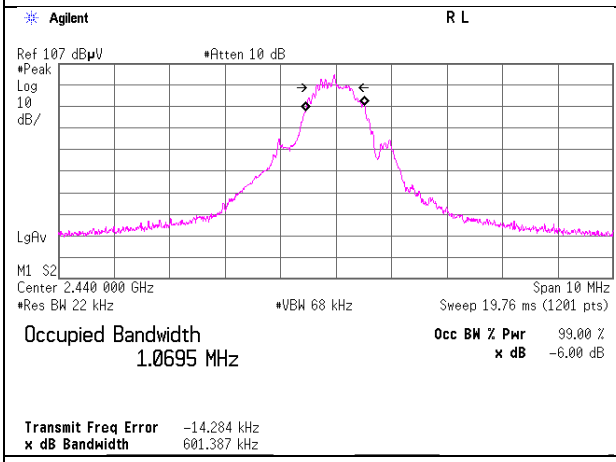
99%Occupied Bandwidth

BT LE

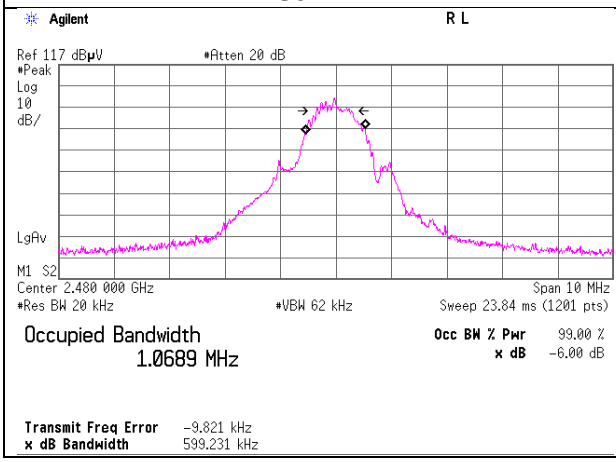
2402 MHz



2440 MHz



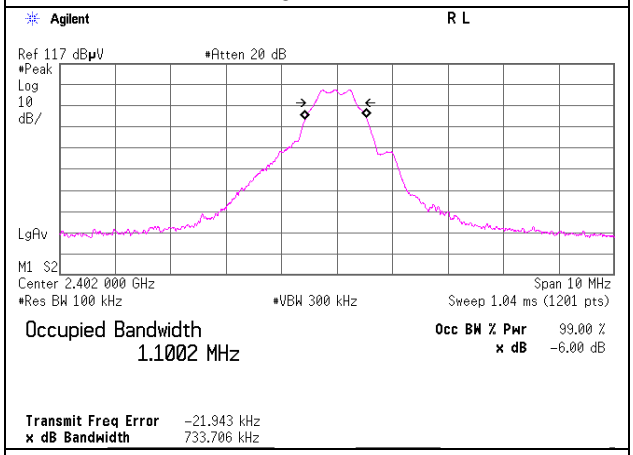
2480 MHz



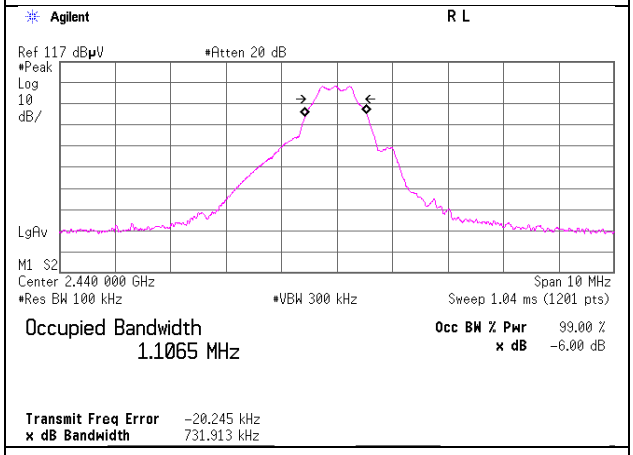
6dB Bandwidth

BT LE

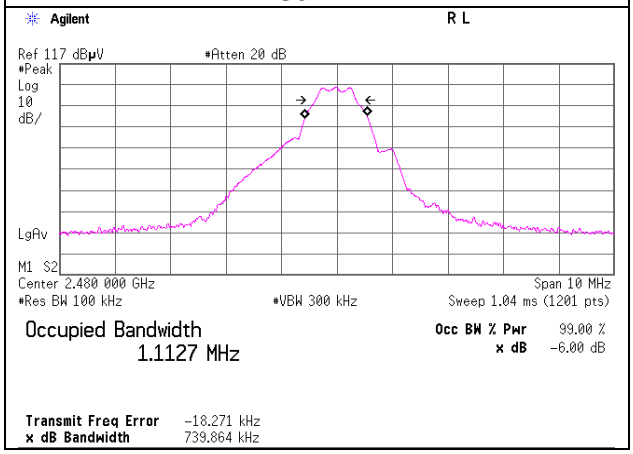
2402 MHz



2440 MHz



2480 MHz



Maximum Peak Output Power

Report No.	13473127S-B-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 24, 2020
Temperature / Humidity	22 deg. C / 62 % RH
Engineer	Toshinori Yamada
Mode	Tx BT LE

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2402	-2.08	1.12	9.63	8.67	7.36	30.00	1000	21.33	2.14	10.81	12.05	36.02	4000	25.21
2440	-1.27	1.12	9.63	9.48	8.87	30.00	1000	20.52	2.14	11.62	14.52	36.02	4000	24.40
2480	-0.93	1.12	9.63	9.82	9.59	30.00	1000	20.18	2.14	11.96	15.70	36.02	4000	24.06

Sample Calculation:
Result = Reading + Cable Loss + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

Average Output Power
(Reference data for RF Exposure)

Report No.	13473127S-B-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 24, 2020
Temperature / Humidity	22 deg. C / 62 % RH
Engineer	Toshinori Yamada
Mode	Tx BT LE

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2402	-4.56	1.12	9.63	6.19	4.16	2.00	8.19	6.59
2440	-3.73	1.12	9.63	7.02	5.04	2.00	9.02	7.98
2480	-3.47	1.12	9.63	7.28	5.35	2.00	9.28	8.47

Sample Calculation:
Result (Time average) = Reading + Cable Loss + Attenuator Loss
Result (Burst power average) = Time average + Duty factor

*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst rate confirmation

Report No.	13473127S-B-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 24, 2020
Temperature / Humidity	22 deg. C / 62 % RH
Engineer	Toshinori Yamada
Mode	Tx BT LE

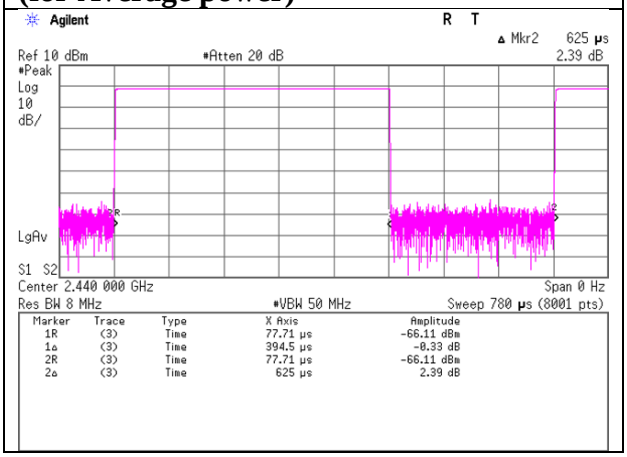
BT LE

Tx on / (Tx on + Tx off) = 0.631

Tx on / (Tx on + Tx off) * 100 = 63.1 %

Duty factor = 10 * log (0.625 / 0.3945) = 2.00 dB

(for Average power)

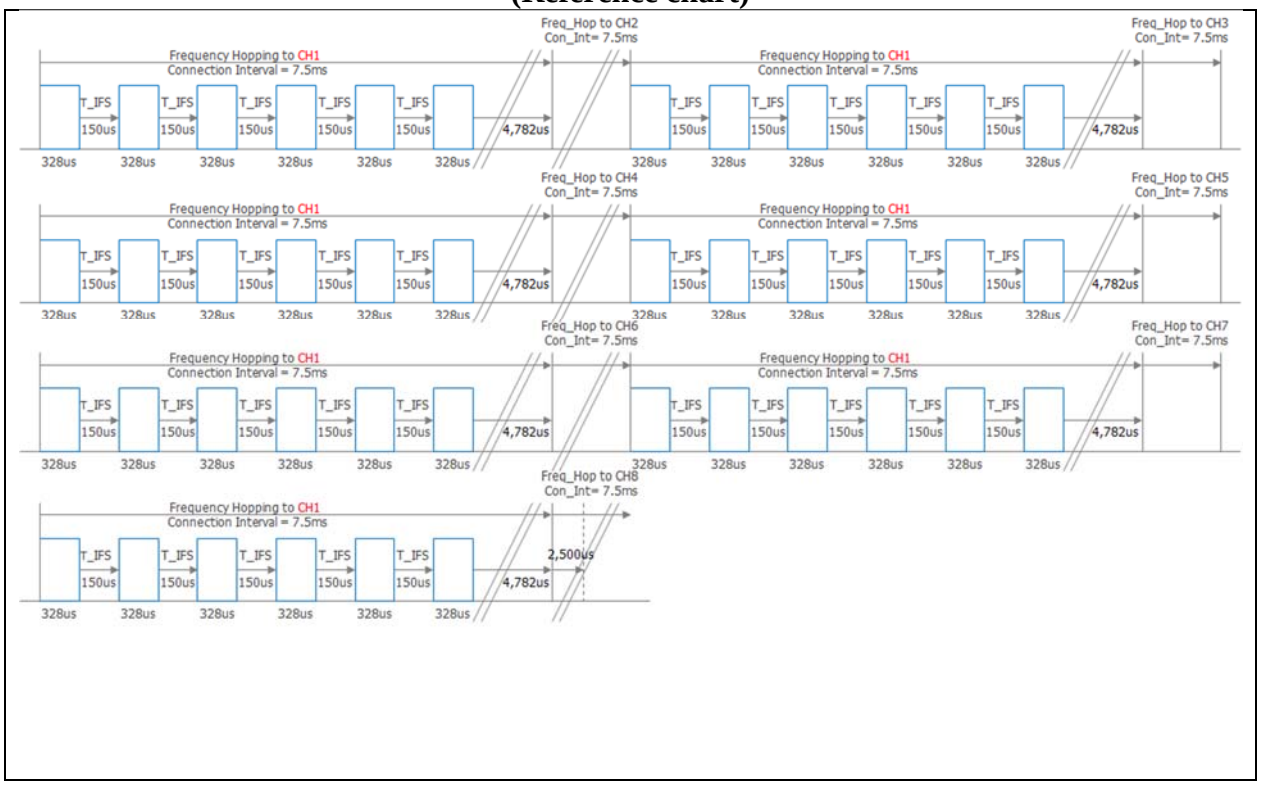


* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Duty cycle correction factor

The information provided from the applicant.

(Reference chart)



(for Duty cycle correction factor for Radiated Spurious Emission)
Worst 100 ms case

DCCF = 20 log(0.328 x 42 / 100) = -17.21 dB *

*On time: 328 us (0.328 ms)
*Maximum opportunity for 1 channel in 100 ms: 7 cycle / 100 ms
*Maximum on time for 1 channel in 100 ms: 7 cycle x 6 times = 42 times / 100 ms

Radiated Spurious Emission

Report No.	13473127S-B-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	August 26, 2020	August 25, 2020	August 26, 2020
Temperature / Humidity	22 deg. C / 55 % RH	23 deg. C / 58 % RH	22 deg. C / 55 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
	(Below 1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -26.5 GHz)
Mode	Tx BT LE 2402 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	63.808	QP	21.70	7.46	7.23	31.83	0.00	4.56	40.00	35.4	150	130	-
Hori.	186.358	QP	21.70	16.27	8.95	31.78	0.00	15.14	43.50	28.3	200	2	
Hori.	305.448	QP	31.90	13.71	6.59	31.79	0.00	20.41	46.00	25.5	100	25	
Hori.	800.037	QP	21.20	20.74	9.18	32.03	0.00	19.09	46.00	26.9	150	321	
Hori.	976.024	QP	20.40	22.34	9.94	30.85	0.00	21.83	53.90	32.0	150	347	
Hori.	1441.242	PK	50.28	25.15	13.00	39.24	2.19	51.38	73.90	22.5	136	144	
Hori.	2390.000	PK	46.08	27.93	13.91	39.55	2.19	50.56	73.90	23.3	151	272	
Hori.	4804.000	PK	50.92	31.47	7.17	39.73	2.19	52.02	73.90	21.8	143	266	
Hori.	7206.000	PK	46.71	36.90	8.89	39.51	2.19	55.18	73.90	18.7	150	278	
Hori.	9608.000	PK	46.05	38.23	10.40	39.66	2.19	57.21	73.90	16.6	150	0	
Vert.	44.979	QP	39.70	13.03	7.39	31.83	0.00	28.29	40.00	**11.7**	100	237	
Vert.	120.042	QP	32.80	13.13	8.20	31.80	0.00	22.33	43.50	21.1	100	125	
Vert.	385.275	QP	23.70	15.28	7.11	31.84	0.00	14.25	46.00	31.7	100	358	
Vert.	456.004	QP	27.80	16.59	7.50	31.93	0.00	19.96	46.00	26.0	100	303	
Vert.	996.689	QP	20.50	22.45	10.04	30.63	0.00	22.36	53.90	31.5	100	236	
Vert.	1441.242	PK	49.35	25.15	13.00	39.24	2.19	50.45	73.90	23.4	154	147	
Vert.	2390.000	PK	45.37	27.93	13.91	39.55	2.19	49.85	73.90	24.0	134	21	
Vert.	4804.000	PK	50.17	31.47	7.17	39.73	2.19	51.27	73.90	22.6	152	222	
Vert.	7206.000	PK	46.71	36.90	8.89	39.51	2.19	55.18	73.90	18.7	150	228	
Vert.	9608.000	PK	45.51	38.23	10.40	39.66	2.19	56.67	73.90	17.2	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1441.242	PK	50.28	25.15	13.00	39.24	-17.21	2.19	34.17	53.9	19.7	*2
Hori.	2390.000	PK	46.08	27.93	13.91	39.55	-17.21	2.19	33.35	53.9	20.5	*1)
Hori.	4804.000	PK	50.92	31.47	7.17	39.73	-17.21	2.19	34.81	53.9	19.0	
Hori.	7206.000	PK	46.71	36.90	8.89	39.51	-17.21	2.19	37.97	53.9	15.9	
Hori.	9608.000	PK	46.05	38.23	10.40	39.66	-17.21	2.19	40.00	53.9	13.9	
Vert.	1441.242	PK	49.35	25.15	13.00	39.24	-17.21	2.19	33.24	53.9	20.6	*2)
Vert.	2390.000	PK	45.37	27.93	13.91	39.55	-17.21	2.19	32.64	53.9	21.2	*1)
Vert.	4804.000	PK	50.17	31.47	7.17	39.73	-17.21	2.19	34.06	53.9	19.8	
Vert.	7206.000	PK	46.71	36.90	8.89	39.51	-17.21	2.19	37.97	53.9	15.9	
Vert.	9608.000	PK	45.51	38.23	10.40	39.66	-17.21	2.19	39.46	53.9	14.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.
*1) Not out of band emission (Leakage Power)
*2) These point are the same duty cycle as Carrier

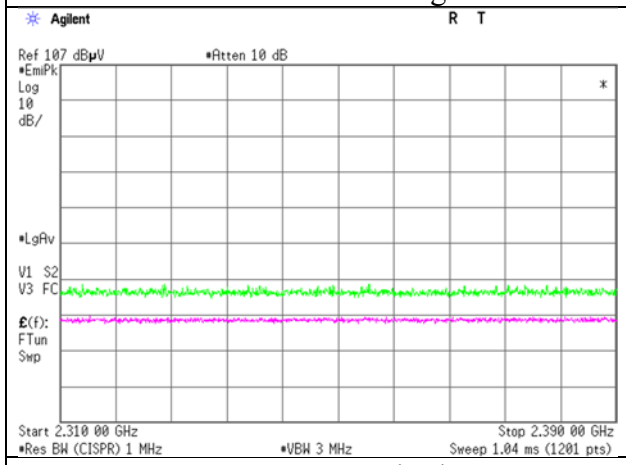
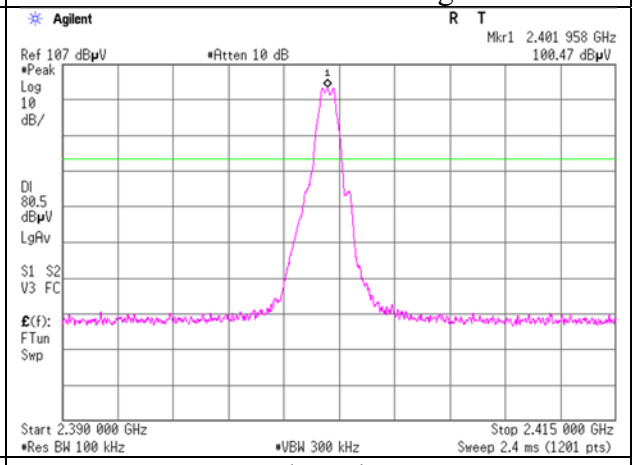
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

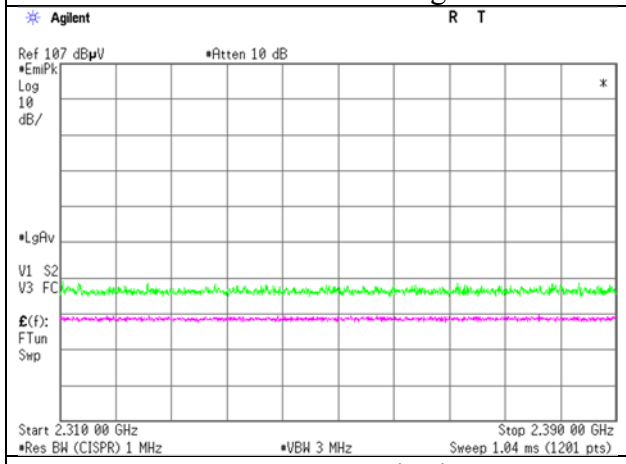
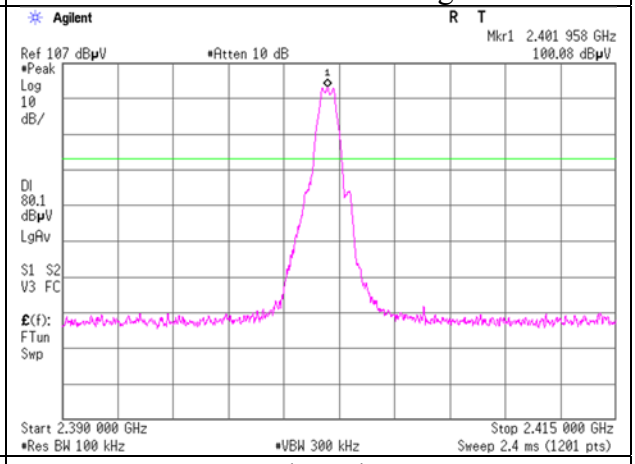
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	100.17	27.92	13.92	39.56	2.19	104.64	-	-	Carrier
Hori.	2400.000	PK	47.79	27.92	13.92	39.56	2.19	52.26	84.64	32.3	
Vert.	2402.000	PK	100.17	27.92	13.92	39.56	2.19	104.64	-	-	Carrier
Vert.	2400.000	PK	44.94	27.92	13.92	39.56	2.19	49.41	84.64	35.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13473127S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.1
Date	August 25, 2020
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Makoto Hosaka
	(1 GHz -2.8 GHz)
Mode	Tx BT LE 2402 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	13473127S-B-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	
Date	August 26, 2020	August 25, 2020	August 26, 2020
Temperature / Humidity	22 deg. C / 55 % RH	23 deg. C / 58 % RH	22 deg. C / 55 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
	(Below 1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -26.5 GHz)
Mode	Tx BT LE 2440 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	62.108	QP	22.00	7.75	7.24	31.83	0.00	5.16	40.00	34.8	203	235	-
Hori.	167.730	QP	22.40	15.53	8.96	31.78	0.00	15.11	43.50	28.3	150	223	
Hori.	305.365	QP	32.40	13.71	6.59	31.79	0.00	20.91	46.00	25.0	100	34	
Hori.	800.453	QP	21.10	20.74	9.18	32.03	0.00	18.99	46.00	27.0	150	87	
Hori.	962.637	QP	20.60	22.22	9.87	30.99	0.00	21.70	53.90	32.2	150	200	
Hori.	1464.071	PK	50.79	25.06	13.02	39.24	2.19	51.82	73.90	22.0	145	149	
Hori.	4880.000	PK	52.02	31.51	7.22	39.72	2.19	53.22	73.90	20.6	151	295	
Hori.	7320.000	PK	45.89	36.94	8.97	39.56	2.19	54.43	73.90	19.4	150	291	
Hori.	9760.000	PK	45.61	38.62	10.45	39.47	2.19	57.40	73.90	16.5	150	0	
Vert.	45.231	QP	39.00	12.93	7.40	31.83	0.00	27.50	40.00	**12.5**	100	278	
Vert.	120.103	QP	31.00	13.14	8.20	31.80	0.00	20.54	43.50	22.9	100	208	
Vert.	377.975	QP	24.40	15.13	7.06	31.83	0.00	14.76	46.00	31.2	100	110	
Vert.	455.996	QP	27.50	16.59	7.50	31.93	0.00	19.66	46.00	26.3	100	327	
Vert.	988.634	QP	20.50	22.39	10.00	30.71	0.00	22.18	53.90	31.7	100	358	
Vert.	1464.065	PK	49.54	25.06	13.02	39.24	2.19	50.57	73.90	23.3	150	149	
Vert.	4880.000	PK	52.46	31.51	7.22	39.72	2.19	53.66	73.90	20.2	160	217	
Vert.	7320.000	PK	47.13	36.94	8.97	39.56	2.19	55.67	73.90	18.2	153	235	
Vert.	9760.000	PK	45.56	38.62	10.45	39.47	2.19	57.35	73.90	16.5	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1464.071	PK	50.79	25.06	13.02	39.24	-17.21	2.19	34.61	53.9	19.2	*1)
Hori.	4880.000	PK	52.02	31.51	7.22	39.72	-17.21	2.19	36.01	53.9	17.8	
Hori.	7320.000	PK	45.89	36.94	8.97	39.56	-17.21	2.19	37.22	53.9	16.6	
Hori.	9760.000	PK	45.61	38.62	10.45	39.47	-17.21	2.19	40.19	53.9	13.7	
Vert.	1464.065	PK	49.54	25.06	13.02	39.24	-17.21	2.19	33.36	53.9	20.5	*1)
Vert.	4880.000	PK	52.46	31.51	7.22	39.72	-17.21	2.19	36.45	53.9	17.4	
Vert.	7320.000	PK	47.13	36.94	8.97	39.56	-17.21	2.19	38.46	53.9	15.4	
Vert.	9760.000	PK	45.56	38.62	10.45	39.47	-17.21	2.19	40.14	53.9	13.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.
*1) These point are the same duty cycle as Carrier

Radiated Spurious Emission

Report No.	13473127S-B-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	
Date	August 26, 2020	August 25, 2020	August 26, 2020
Temperature / Humidity	22 deg. C / 55 % RH	23 deg. C / 58 % RH	22 deg. C / 55 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
	(Below 1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -26.5 GHz)
Mode	Tx BT LE 2480 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	62.959	QP	22.00	7.62	7.24	31.83	0.00	5.03	40.00	34.9	150	0	-
Hori.	166.059	QP	22.70	15.47	8.95	31.78	0.00	15.34	43.50	28.1	150	1	
Hori.	319.654	QP	28.10	14.16	6.69	31.79	0.00	17.16	46.00	28.8	100	223	
Hori.	800.019	QP	21.10	20.74	9.18	32.03	0.00	18.99	46.00	27.0	150	201	
Hori.	961.254	QP	20.60	22.20	9.87	31.00	0.00	21.67	53.90	32.2	150	243	
Hori.	1488.269	PK	52.21	24.95	13.05	39.24	2.19	53.16	73.90	20.7	100	0	
Hori.	2483.500	PK	48.05	27.84	14.00	39.58	2.19	52.50	73.90	21.4	139	286	
Hori.	4960.000	PK	56.91	31.69	7.29	39.71	2.19	58.37	73.90	15.5	149	289	
Hori.	7440.000	PK	46.96	37.02	9.06	39.62	2.19	55.61	73.90	18.2	189	141	
Hori.	9920.000	PK	45.41	38.66	10.48	39.28	2.19	57.46	73.90	16.4	150	0	
Vert.	45.528	QP	40.30	12.82	7.40	31.83	0.00	28.69	40.00	**11.3**	100	220	
Vert.	119.964	QP	33.40	13.13	8.20	31.80	0.00	22.93	43.50	20.5	100	164	
Vert.	372.203	QP	24.30	15.07	7.02	31.83	0.00	14.56	46.00	31.4	100	3	
Vert.	455.996	QP	27.50	16.59	7.50	31.93	0.00	19.66	46.00	26.3	100	118	
Vert.	992.161	QP	20.40	22.41	10.02	30.68	0.00	22.15	53.90	31.7	100	347	
Vert.	1487.974	PK	51.03	24.95	13.05	39.24	2.19	51.98	73.90	21.9	134	233	
Vert.	2483.500	PK	43.75	27.84	14.00	39.58	2.19	48.20	73.90	25.7	107	358	
Vert.	4960.000	PK	57.98	31.69	7.29	39.71	2.19	59.44	73.90	14.4	172	146	
Vert.	7440.000	PK	46.89	37.02	9.06	39.62	2.19	55.54	73.90	18.3	154	236	
Vert.	9920.000	PK	45.23	38.66	10.48	39.28	2.19	57.28	73.90	16.6	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1488.269	PK	52.21	24.95	13.05	39.24	-17.21	2.19	35.95	53.9	17.9	*2)
Hori.	2483.500	PK	48.05	27.84	14.00	39.58	-17.21	2.19	35.29	53.9	18.6	*1)
Hori.	4960.000	PK	56.91	31.69	7.29	39.71	-17.21	2.19	41.16	53.9	12.7	
Hori.	7440.000	PK	46.96	37.02	9.06	39.62	-17.21	2.19	38.40	53.9	15.5	
Hori.	9920.000	PK	45.41	38.66	10.48	39.28	-17.21	2.19	40.25	53.9	13.6	
Vert.	1487.974	PK	51.03	24.95	13.05	39.24	-17.21	2.19	34.77	53.9	19.1	*2)
Vert.	2483.500	PK	43.75	27.84	14.00	39.58	-17.21	2.19	30.99	53.9	22.9	*1)
Vert.	4960.000	PK	57.98	31.69	7.29	39.71	-17.21	2.19	42.23	53.9	11.6	
Vert.	7440.000	PK	46.89	37.02	9.06	39.62	-17.21	2.19	38.33	53.9	15.5	
Vert.	9920.000	PK	45.23	38.66	10.48	39.28	-17.21	2.19	40.07	53.9	13.8	

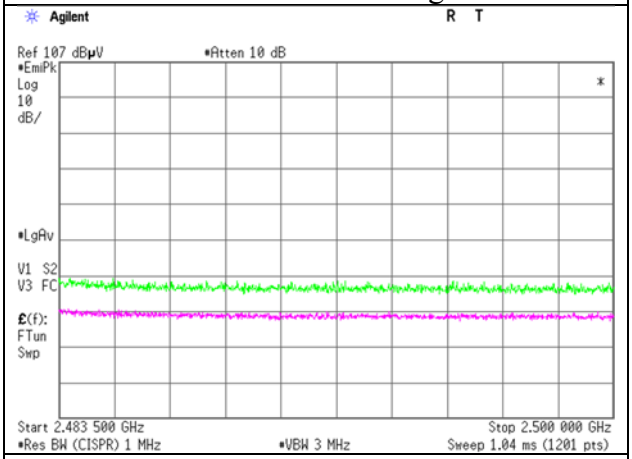
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.
*1) Not out of band emission (Leakage Power)
*2) These point are the same duty cycle as Carrier

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13473127S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.1
Date	August 25, 2020
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Makoto Hosaka
	(1 GHz -2.8 GHz)
Mode	Tx BT LE 2480 MHz

Horizontal

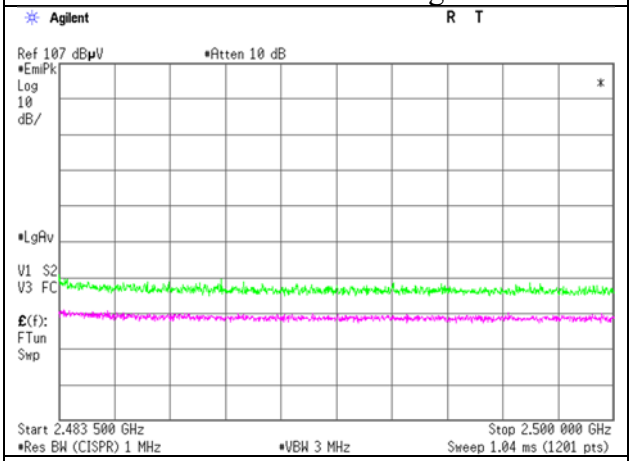
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

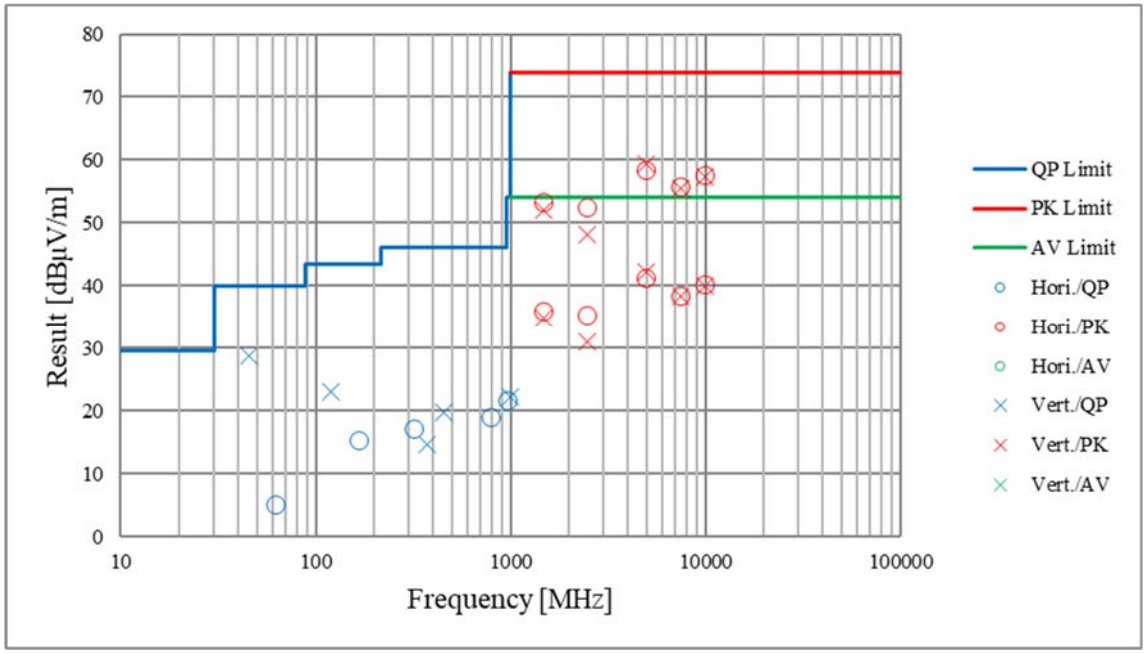


Trace Green : Peak Plot
Trace Purple : Average Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	13473127S-B-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	
Date	August 26, 2020	August 25, 2020	August 26, 2020
Temperature / Humidity	22 deg. C / 55 % RH	23 deg. C / 58 % RH	22 deg. C / 55 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
	(Below 1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -26.5 GHz)
Mode	Tx BT LE 2480 MHz		

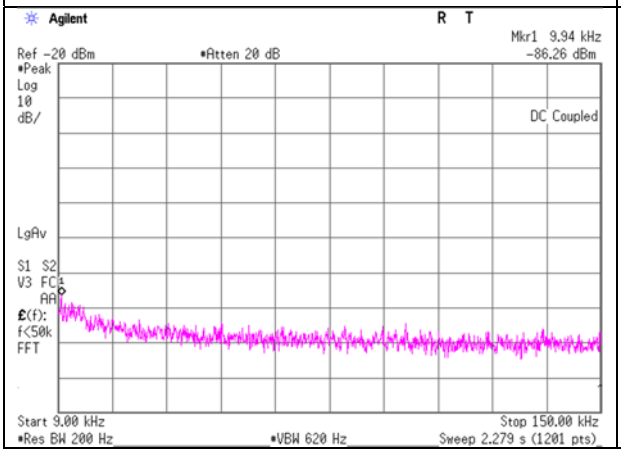


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

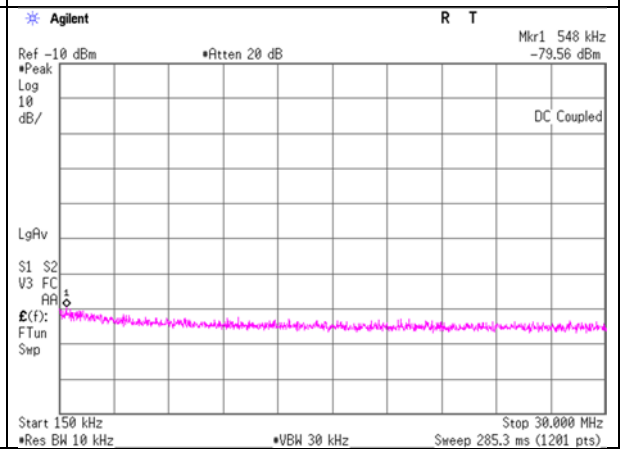
Conducted Spurious Emission

Report No.	13473127S-B-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 24, 2020
Temperature / Humidity	22 deg. C / 62 % RH
Engineer	Toshinori Yamada
Mode	Tx BT LE 2402 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
9.94	-86.26	0.01	9.54	2.14	1	-74.6	300	6.0	-13.3	47.6	60.9	-
548.00	-79.56	0.02	9.54	2.14	1	-67.9	30	6.0	13.4	32.8	19.4	-

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

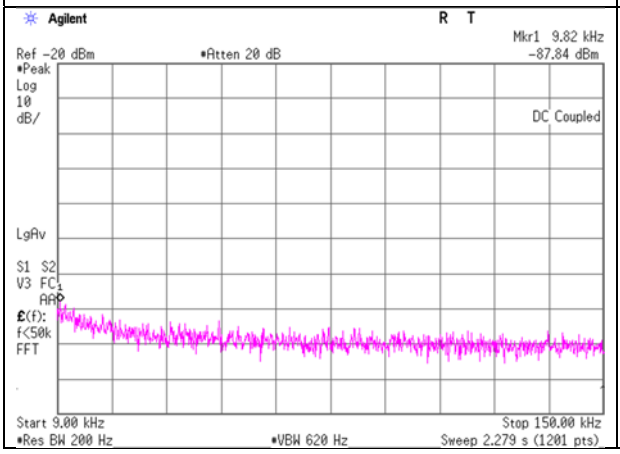
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

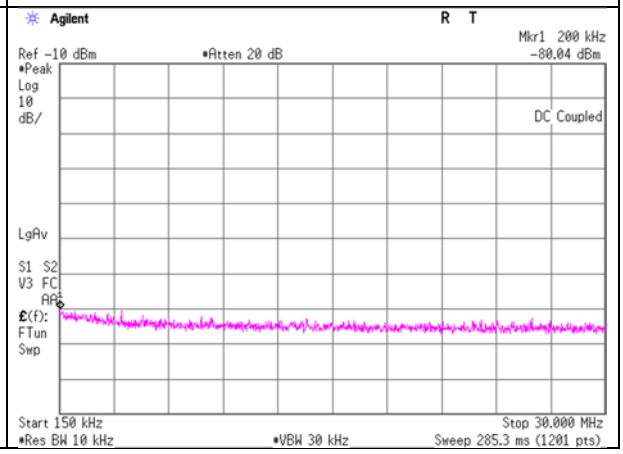
Conducted Spurious Emission

Report No.	13473127S-B-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 24, 2020
Temperature / Humidity	22 deg. C / 62 % RH
Engineer	Toshinori Yamada
Mode	Tx BT LE 2440 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
9.82	-87.84	0.01	9.54	2.14	1	-76.2	300	6.0	-14.9	47.7	62.6	-
200.00	-80.04	0.01	9.54	2.14	1	-68.3	300	6.0	-7.1	21.5	28.6	-

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

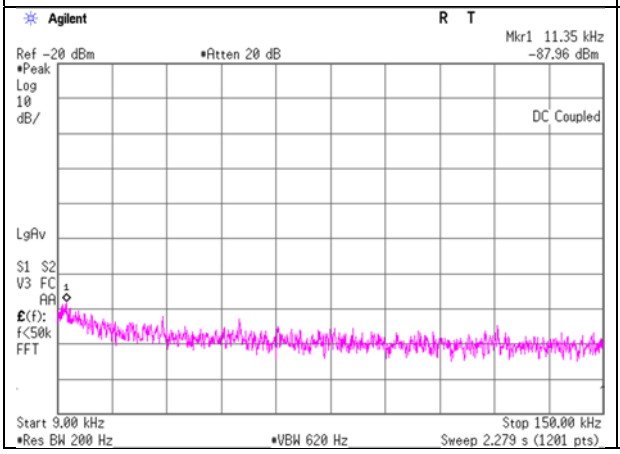
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

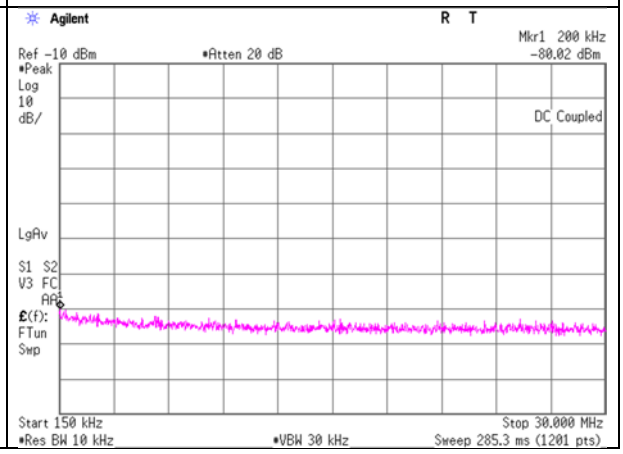
Conducted Spurious Emission

Report No.	13473127S-B-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 24, 2020
Temperature / Humidity	22 deg. C / 62 % RH
Engineer	Toshinori Yamada
Mode	Tx BT LE 2480 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.35	-87.96	0.01	9.54	2.14	1	-76.3	300	6.0	-15.0	46.5	61.5	-
200.00	-80.02	0.01	9.54	2.14	1	-68.3	300	6.0	-7.1	21.5	28.6	-

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

Power Density

Report No.	13473127S-B-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 24, 2020
Temperature / Humidity	22 deg. C / 62 % RH
Engineer	Toshinori Yamada
Mode	Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402	-16.01	1.12	9.63	-5.26	8.00	13.26
2440	-15.17	1.12	9.63	-4.42	8.00	12.42
2480	-14.90	1.12	9.63	-4.15	8.00	12.15

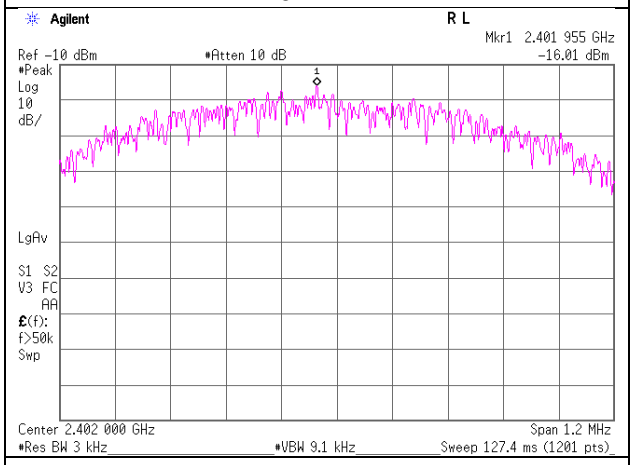
Sample Calculation:
Result = Reading + Cable Loss + Attenuator Loss

*The equipment and cables were not used for factor 0 dB of the data sheets.

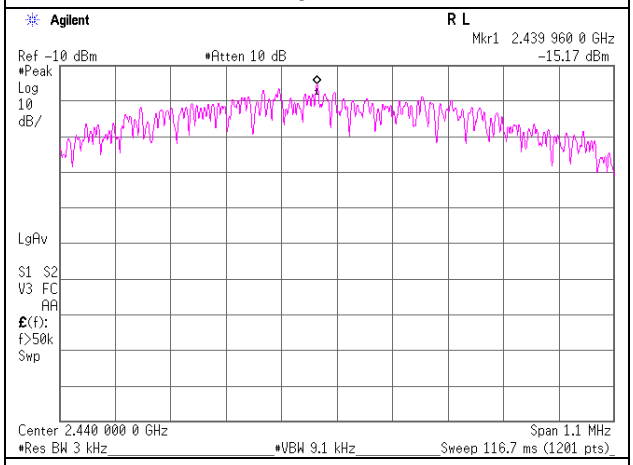
Power Density

BT LE

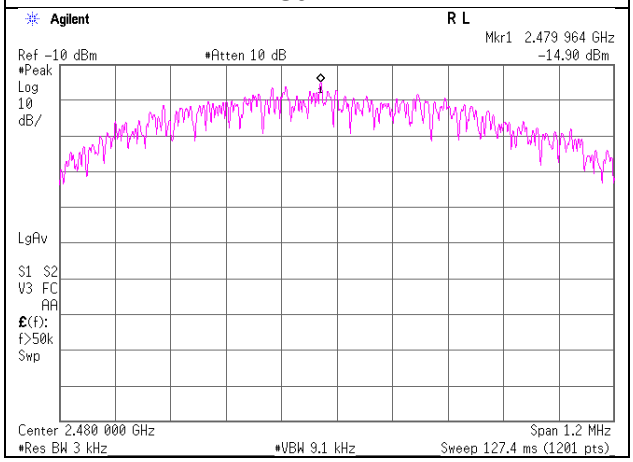
2402 MHz



2440 MHz



2480 MHz



APPENDIX 2: Test instruments

Test equipment

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
AT	KTS-07	145111	Digital Tester	SANWA	PC500	7019232	2019/10/01	12
AT	SAT10-09	145132	Attenuator	Weinschel Corp.	54A-10	W5692	2019/11/05	12
AT	SCC-G12	145040	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	2020/03/02	12
AT	SCC-H20	159940	Microwave cable	RS Pro	R-132G7210 100CO	-	2019/11/07	12
AT	SOS-27	191845	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2019/12/12	12
AT	SPM-07	146247	Power Meter	Keysight Technologies Inc	8990B	MY5100272	2020/05/27	12
AT	SPSS-04	146310	Power sensor	Keysight Technologies Inc	N1923A	MY5326009	2020/05/27	12
AT	SRENT-15	160899	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46185516	2020/01/15	12
CE	KAT3-12	144896	Attenuator	JFW IND. INC.	50HF-003N	-	2020/07/16	12
CE	SCC-B12/B13/SRSE-02	144969	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-270(RF Selector)	2020/04/17	12
CE	SLS-04	145541	LISN	Rohde & Schwarz	ENV216	100514	2020/02/19	12
CE	SOS-22	191839	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2019/12/12	12
CE	STR-01	145790	Test Receiver	Rohde & Schwarz	ESU40	100093	2020/04/24	12
CE	STS-02	145793	Digital Hitester	Hioki	3805-50	80997819	2020/04/09	12
CE,RE	COTS-SEMI-5	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE,ME,PE)	-	-	-
CE,RE	KJM-09	145929	Measure	KOMELON	KMC-36	-	-	-
RE	KAT6-04	144899	Attenuator	Inmet	18N-6dB	-	2019/12/05	12
RE	KSA-08	145089	Spectrum Analyzer	Keysight Technologies Inc	E4446A	MY46180525	2019/11/05	12
RE	SAEC-01(NSA)	145597	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	2020/04/08	12
RE	SAEC-01(SVSWR)	145561	Semi-Anechoic Chamber	TDK	SAEC-01(SVSWR)	1	2020/05/04	12
RE	SAF-01	145003	Pre Amplifier	SONOMA	310N	290211	2020/02/19	12
RE	SAF-04	145127	Pre Amplifier	Toyo Corporation	TPA0118-36	2072554	2020/06/02	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2020/03/03	12
RE	SAT10-06	145137	Attenuator	Keysight Technologies Inc	8493C-010	74865	2019/11/06	12
RE	SAT3-09	144959	Attenuator	JFW	50HF-003N	-	2020/08/18	12
RE	SBA-01	145161	Biconical Antenna	Schwarzbeck Mess - Elektronik	BBA9106	91032664	2020/04/04	12
RE	SCC-A1/A3/A5/A7/A8/A13/SRSE-01	144967	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	2020/04/12	12
RE	SCC-A2/A4/A6/A7/A8/A13/SRSE-01	144968	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	2020/04/12	12

Test equipment

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
RE	SCC-G05	145039	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	2020/01/31	12
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2020/03/04	12
RE	SCC-G41	151617	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S006	2020/01/08	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2020/05/12	12
RE	SCC-G62	196985	Coaxial Cable	HUBER+SUNER	SUCOFLEX 102	803650/2	2020/03/10	12
RE	SCC-G68	200008	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	575616/4	2020/07/07	12
RE	SFL-02	145301	Highpass Filter	MICRO-TRONICS	HPM50111	51	2019/11/06	12
RE	SHA-01	145383	Horn Antenna	Schwarzbeck Mess - Elektronik	BBHA9120D	9120D-725	2020/05/27	12
RE	SHA-04	145512	Horn Antenna	ETS LINDGREN	3160-09	00094868	2020/06/15	12
RE	SHA-08	194683	Horn Antenna	Schwarzbeck Mess - Elektronik	BBHA 9120 C	694	2020/02/17	12
RE	SLA-05	145527	Logperiodic Antenna	Schwarzbeck Mess - Elektronik	VUSLP9111B	193	2020/04/04	12
RE	SOS-20	191837	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2019/12/12	12
RE	STR-07	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2019/09/13	12
RE	STS-01	145792	Digital Hitester	Hioki	3805-50	80997812	2019/10/01	12

***Hyphens for Last Calibration Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.**

The expiration date of the calibration is the end of the expired month.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test item: **CE: Conducted Emission test**
RE: Radiated Emission test
AT: Antenna Terminal Conducted test